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Research Article

The Relation between Facial Injury Severity Scale (FISS) with Head and Cervical Injury at RSUP H. Adam Malik Medan

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Abstract:

Introduction: Maxillofacial trauma is a special trauma because it can cause impairment of a number of important functions on the face. Patients with maxillofacial trauma are highly at risk for head and cervical injury. Facial Injury Severity Scale (FISS) is a clinical assessment system to look at the severity of maxillofacial trauma, predict the prognostic value of maxillofacial trauma patients and as a research tool. The purpose of this study was to determine the relationship between Facial Injury Severity Scale (FISS) with head injury and neck injury at RSUP H. Adam Malik Medan.

Methods: This design of this study is an analytical study with cross sectional design. 31 patients who were diagnosed of having concomitant maxillofacial and head injury by appropriate skull X-Ray and CT Scan of brain were included in this study. Maxillofacial trauma patients who were experienced with hematoma, excoriation and had normal investigative results did not participate in the study. Information's based on age, sex, mode of injury, pattern of facial and head injury, GCS score and type of head injury was taken for each case. The variables in this study were FISS and head injury. Variable head injuries are divided into intracranial lesions and GCS. The data between FISS and GCS were analyzed with Spearman correlation test and to assess the relationship of FISS with intracranial lesions using ANOVA test.

Results : 31 maxillofacial trauma patients which consist of 23 (74.2%) males participated in this study. Mean ± SD of patient's age was 25.84 ± 11.45. The FISS scores was calculated for each patient (average FISS: 3.00 ± 1.43, range 1 to 6. Mandible was the most commonly fractured facial bone (38,7%). Majority of the patients had mild head injury (87,1%) and there was no cervical injury was present in all patients (100%). The most frequent etiology was due to traffic accidents, especially motorcyclists as many as 30 (96.7%) patients and did not wear helmet in 26 (83.9%) patients. The highest mean FISS patients based on the type of head injury was in mild head injury group (3.07 ± 1.46). The highest mean FISS was in the EDH group (4.00 ± 1.00) and open depressed fracture with pneumocephalus (4.00 ± 1.45). Spearman correlation test between FISS and GCS did not give statistically significant result and showed low correlation (r = 0,276, p = 0,133). The relation between FISS and intracranial lesions did not show significant result (p = 0,501).

Conclusion: Out of 31 subjects with maxillofacial injury, 31 (100%) patients had head injury and none of the patients had cervical injury with a mean FISS score of 3.00 ± 1.43. From the statistical analysis using ANOVA test, it is found that there is no relationship between FISS and intracranial lesion with p> 0,05 (p = 0,501) and there is no relationship between FISS and GCS with p> 0,05 (p = 0,713).

Keywords: Maxillofacial injury, FISS, facial fracture, head injury, cervical injury

INTRODUCTION

Trauma is a major health problem at present day because it is associated with high morbidity and mortality. Maxillofacial trauma has been a major focus due to the high incidence of the disease and requires multispecialty management. In maxillofacial trauma, whether accompanied or without systemic disease, remains the largest number of inpatients, especially in the emergency room. A clear understanding of maxillofacial anatomy and the mechanism of trauma is necessary, not only as a diagnosis, but also to determine the severity of the maxillofacial trauma (Ramalingan, 2014). Maxillofacial trauma is predominantly male, with a 3: 1 ratio and the most common etiology due to motorcyclists' accidents, due to a lack of concern about the safety of the soul while driving like helmet wear and low awareness about ethical traffic (Khan, 2013). Maxillofacial areas remain associated with a number of important functions such as providing protection against the head, sight, smell, breathing, speech, and appearance (Singh, 2012). Patients with maxillofacial fractures are at high risk of head and cervical injury that

results in intracranial lesions, bruising of the brain, or fractures

of the skull bone. This occurs when cranium is impacted on a large area, there can be deformity of the skull with inward or outward bending (Sastrodiningrat, 2012).

The presence or absence of a cervical spine injury has important implications for trauma patients because it affects airway management techniques, diagnostic imaging study options, surgical approaches, and time to correct facial fractures at the same time. Also reported patients with facial trauma, have a cervical trauma incidence of 0% -4%. This association with mandibular trauma has a high risk of cervical trauma and injury to the upper face is associated with a lower cervical injury (Merrit et al., 1997).

Many statistical systems have evolved to predict the prognosis of trauma patients. The scoring system is based on the anatomical location of trauma, physiological data, and the findings of both physical and combinational examinations. The Glasgow Coma Scale (GCS) examination has generally been used to evaluate the level of awareness in trauma patients. The scoring system of maxillofacial trauma involves the complexity of the maxillofacial anatomy including the articulation of the bone and its function in a complex manner. There have been many maxillofacial trauma scoring systems used, but Bagheri et al (2006) developed a Facial Injury Severity Scale (FISS) to evaluate different facial fractures (Ramalingan, 2014 and Bagheri et al., 2006).

The FISS can also be easily assessed and used to predict the severity of the maxillofacial trauma and determine prompt and appropriate management, and as an accurate communication medium to other health workers to determine the severity of the trau

METHODS

This design of this study is an analytic study with cross-sectional design. Samples were collected through primary data with inclusion criterias were maxillofacial trauma patients aged> 18 years and who have examined appropriate Head CT Scan and X-Ray cervical during the period from April to May 2018.

Maxillofacial trauma patients who were experienced with hematoma, excoriation, and had normal investigation resultsare excluded. Sampling is done by consecutive sampling. The minimum number of samples calculated by the formula:

$$n = \left\{\frac{Z\alpha+Z\beta}{0{,}5\ln\left[\frac{1+r}{1-r}\right]}\right\}^2 + 3 = \left\{\frac{1.96+0.842}{0{,}5\ln\left[\frac{1+0.29}{1-0.29}\right]}\right\}^2 + 3$$

Information:

n = sample size

Zα = standard deviation α (Type I error rate) = 5%, then Zα = 1.96

Zβ = standard deviation β (Type II error rate) = 20%, then Zβ = 0,842

r = 0,29 (based on previous research results) (Mbeba D, 2014)

Based on the formula above, the minimum sample size of this study is 29 people.

The collected data will be presented descriptively in the frequency distribution table. The datas between FISS and GCS were analyzed using Spearman correlation test and the relation between FISS and intracranial lesion was done by ANOVA test.

RESULTS

Sample Characteristics

A total of 31 patients consisting of 23 (74.2%) men and 8 (25.8%) women were included in the study. The mean ± SD patient age was 25.84 ± 11.45 years. The average FISS Score in this study was 3.00 ± 1.43 with a minimum value of 1, a maximum score of 6, and the most patients had FISS 2 (25.8%) and 4 (25.8%). The mandible is the most common site of fracture in 12 (38.7%) patients, the most common etiology caused by traffic accidents on motorcycle riders as 53 (92%), mild head injury 27 (87.1%) and 26 (83,9%) did not wear a helmet. FISS rates based on the highest intracranial lesion were in the EDH group (4.00 ± 1.00) and open depressed fracture with pneumocephalus (4.00 ± 1.45) and FISS rates were highest on GCS in the mild head injury group (3.07 ± 1.46).

Tabel 1. Characteristics of Research Sample

Characteristic	Frequency (N)	Percentage (%)
Age (Mean ± SD)	25,84 ± 11,45	
FISS (Mean ± SD)	3.00 ± 1,43	
1	5	16,1
2	8	25,8
3	6	19,4
4	8	25,8
5	2	6,5
6	2	6,5
Sex		

Man	23	74,2
Woman	8	25,8
Fracture Location		
Mandible	12	38,7
Zygoma	4	12,9
Maxilla	3	9,7
Mandible + Maxilla	8	25,8
Maxilla + Nasoethmoid	1	3,2
Mandible + Zygoma	2	6,5
Maxilla + Rimaorbita	1	3,2
Etiology		
Traffic Accidents	30	96,7
Others trauma	1	3,2
Helmet use		
Yes	5	16,1
No	26	83,9

Tabel 2. Mean FISS based on GCS

GCS	Frequency (n)	Percentage (%)	Mean FISS (Mean ± SD)
Mild Head Injury	27	87,1	3,07 ± 1,46
Moderate Head Injury	3	9,7	2,67 ± 1,52
Severe Head Injury	1	3,2	2,00

Tabel 3. Mean FISS based on Intracranial Lesions

Intracranial Lesion	Frequency (N)	Percentage (%)	FISS (Mean ± SD)
EDH	3	9,7	4,00 ± 1,00
SAH	1	3,2	1,00
DAI	1	3,2	2,00
Contusio Serebri	2	6,5	3,00 ± 1,41
Open Depressed Fx + Pneumocephali	1	3,2	4,00
Contusio Serebri + EDH + SAH	1	3,2	3,00
EDH + Contusio Serebri	2	6,5	1,50 ± 0,70
Normal	20	64,5	3,21 ± 1,47

Tabel 4. Mean FISS based on Cervical Injury

Cervical Injury	Frequency (N)	Percentage (%)	FISS (Mean ± SD)
Cervical Injury (+)	0	0	-
Cervical Injury (-)	31	100	3.00 ± 1,43

The assessed subject characteristic of this study included FISS and head injury variables. Variables of head injury are divided into intracranial lesion and GCS. The intracranial lesion variable is a categorical variable and GCS is a numerical variable. Hypothesis testing to see the correlation between FISS and GCS was analyzed by Spearman correlation test. As for hypothesis testing to see whether there is relationship between FISS with intracranial lesion analyzed by using ANOVA test.

Tabel 6. Tabel Result of Spearman Correlation Analysis between FISS and GCS

	GCS
FISS	***r* = 0,276** ***p* = 0,133** ***n* = 31**

Based on the table above showed the correlation value does not provide a significant relationship and had a low correlation

value between FISS and GCS
(r = 0,276, p = 0,133)

Tabel 7. Relation between FISS and Intracranial Lesion based on ANOVA test

	FISS
	p Value
Intracranial lesion	**0,501**

Based on the results of analysis using ANOVA test in the table above known that there was no relationship between FISS with intracranial lesion seen from p> 0,05 (p = 0,501).

DISCUSSION

In this study found that the mean age of maxillofacial trauma patients was 25.84 ± 11.45 years with the highest number of patients at the age of 18 years. The study by Kesuma and Bangun (2009) conducted at RSCM Jakarta stated that the mean age of maxillofacial trauma is 27.5 ± 11.5 years because the age is productive age which has high mobility causing traffic accident, so it allows such age to be more susceptible to the incidence of maxillofacial trauma (Kraus et al., 2003). Patients with maxillofacial trauma by sex were male (23, 74.2%) and female (8) (25.8%) subjects as men were more likely to engage in outdoor activities such as driving, sports or fighting (Ajmal, 2007 and You et al., 2017).

The average FISS Score in this study was 3.00 ± 1.43 with a minimum value of 1, a maximum score of 6, and the most patients had FISS 2 (25.8%) and 4 (25.8%). This is consistent with research conducted by Kesuma and Bangun (2009) in RSCM which states that the average FISS is 3.37 ± 1.9 with minimum value 1 and maximum 9, and most with FISS 2 (24,7%). From these results can be concluded that all trauma has a minimum score. The difference in the range of FISS values is not too far due to the low acceleration of trauma in Jakarta caused by the high rate of traffic, the discipline in obeying traffic signs, which in turn can lead to maxillofacial trauma (Kesuma and Bangun, 2017).

In this patient, based on the location of fracture, the most are mandibular fractures in 12 (38.7%) patients. This is in accordance with a study by Roni (2014) which states that the location of the mandibular fracture is the most common of 50.6%, as well as in the research of Hasnat et al. (2017) which states the location of the most common fracture is the mandible (36%) in patients with maxillofacial trauma. Traffic accidents on motorcyclists are the most common etiology of 30 (96.7%) patients. Research by Kesuma and Bangun (2009) states 81.4% trauma due to motorcycle accidents. Similarly, research by Hasnat et al. (2017) the most common etiology is an accident on motorcyclists as many as 36 (60%) of patients. Research by Sheturaja (2017) in India mentions that motorcycle accidents are a frequent occurrence (51%), followed by trauma due to a 27% fall (Sheturaja, 2017). Research by You et al. (2017) also stated that motorcycle accidents are the most common etiology of maxillofacial trauma in 44 (21.36%) patients. Based on the use of helmets found that 26 (83.9%) of patients did not wear helmets. This is similar to the research conducted by Kesuma and Bangun (2009) which states 54.4% of motorcyclists do not wear helmets.

From the GCS assesment it was found that 27 (87.1%) patients had mild head injury, 3 (9.7%) moderate head injury, and 1 (3.2%) severe head injury. the highest FISS GCS rate was in the mild head injury group (3.07 ± 1.46), in contrast to a study by You et al. (2017) who stated severe head injury has a higher FISS average. You et al declared a decrease in GCS and loss of consciousness associated with the occurrence of facial fractures. Patients with head injury who have upper facial fracture would be more susceptible to neurological disorders compared with mid-face fracture or mandibular fracture are more often associated with higher incidence of brain injury although head injury and facial fractures may occur together (You et al., 2017).

In this study, of 31 (100%) patients, none of the cervical injuries were found. This is because the incidence of head injury associated with a very small cervical injury is about 1% -6% (Peterson, 2001), as well as research by Hasler et al. (2012) who reported the incidence rate is very small, ie 19-88 cases per 100,000 people, and 35-53 per one million people. Research by Beirne et al. (1995) also stated that the incidence of cervical injury to facial fractures was only 1.3-4%. Research by Mukherjee and Revington (2014) states that the range of incidence of maxillofacial injury with cervical injury is 0 to 8%.

From the data analysis also found that the mean of FISS based on the highest intracranial lesion was in the EDH group (4.00 ± 1.00) and open depressed fracture with pneumocephalus (4.00 ± 1.45). This is the same in a study by You et al. (2017) which suggests that facial bone damage is associated with worsening neurological conditions, high rates of parenchymal damage and cerebral edema. Maxillofacial fractures are caused by impact mechanisms, so that brain damage can be caused by direct contact or inertial mechanism.

The highest mean FISS based on GCS was in the mild head injury group (3.07 ± 1.46), in contrast to a study by You et al. (2017) who stated severe head injury has a higher FISS average. You et al declared a decrease in GCS and loss of consciousness associated with the occurrence of facial fractures. Patients with head injury who have upper facial fracture would be more susceptible to neurological disorders compared with mid-face fracture or mandibular fracture are more often associated with higher incidence of brain injury although head injury and facial fractures may occur together (You et al., 2017).

Result of correlation test between FISS and GCS using Spearman correlation test and got r value = 0,276 and p value = 0,133 so concluded there is no significant relation between FISS and GCS. This is in contrast to the research conducted by You et al. (2017) which states there is a relationship between FISS and GCS (p <0.05). Contrast a research by Mbeba D (2004) obtained value r = 0.29 (weak correlation

strength, r = 0.2 - <0.4). Result of ANOVA test analysis in this research, concluded that there is no relationship between FISS with intracranial lesion by looking at p value (p = 0,501 (p> 0,05)). This is in contrast to the research conducted by You et al. (2017) suggesting a relationship between FISS and intracranial lesions (p <0.05). This difference is due to the small number of samples to meet the inclusion and exclusion criteria, the trauma mechanisms in this study and previous studies differ due to differences in culture and geographical location that play an important role in the incidence and prevalence of maxillofacial trauma.

CONLUSSION

Based on this study there is no relationship between FISS with head and cervical injury. However, FISS can still be used as a meaningful assessment of the severity of maxillofacial trauma and determine prompt and appropriate management. FISS can also be used as a tool of communication to other health personnel to accurately determine the severity and management in patients with maxillofacial trauma. Emergency clinicians should also screen all motorcyclists suffering from maxillofacial injuries with head injuries, including the status of helmet use. The high use of helmets on motorcyclists can reduce the risk of head injury trauma due to low transfer of energy from the facial bone to the intracranial.

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